

STRANGULATION OF TESTICLE FROM TWIST OF THE SPERMATIC CORD.¹

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THAT so rare a lesion should not have been observed before 1885 is surprising. I say rare lesion advisedly, because up to the present I have been able to collect only fourteen cases where strangulation of the testicle was dependent on torsion of the cord, though all know that gangrene of the testicle may follow orchitis, neglected strangulated hernia, epididymitis from gonorrhœa, and Gerster mentions two cases of spontaneous gangrene not associated with the peculiar twist of the cord.

Again, to explain the surprise at no one having observed so rare a lesion earlier, we must remember that, being a macroscopic trouble, it was capable of observation by the ancients prior to the introduction of the finer methods of instrumental diagnosis, yet we find no record of the Fathers bearing on the subject. The method of producing sterility in men and animals by twisting the cord intentionally was, however, not unknown nor unpractised.

To have collected fourteen cases from less than ten years means that many a case must have been overlooked before gangrene was considered a possibility, or put down to irreducible hernia, and more or less risk run from neglect.

No modern surgery that I am familiar with mentions it, except Ashhurst's last edition, quoting my case with three or four others. Morrow's "System of Genito-Urinary Diseases"

¹ Read before the Clinical Society of Maryland, February 16, 1894.

does not consider it, nor does Moullin, though I believe a late work by Jacobson, "Diseases of Male Organs of Generation," mentions it. The best *résumé* of the cases is found appended to a report of Case No. 13 from table by Mr. Edmund Owen¹, to which I am largely indebted for the details of this paper.

That the accident is not confined to the human species, I would call attention to a paper by Mr. J. Bland Sutton,² reporting a case of torsion of the spermatic cord in a dog with consequent necrosis of the testicle. In this case the rotation was caused by a growth. He concludes by saying, "We have now evidence that nearly every viscus in the belly is liable to rotate axially and twist its pedicle,—*e.g.*, testicles, kidneys, spleen, ovaries, and the gravid uterus. Tumors, such as ovarian cysts, dilated tubes, myomata, omental hydatids, and the like, are also liable to rotation."

Causes.—From the number of times that non-descent of the testicle has been associated with gangrene, eight out of ten in the table, we find ground for belief that this is another danger which besets the misplaced gland in addition to the increased liability to sterility, malignancy, and atrophy over its normally-placed mate.

The occasional hernia in the same locality augments the risk by the presence of a foreign body in the scrotum, but more decidedly by the taxis undertaken by the patient or his attendant twisting the cord.

Strain, though occurring in every man, woman, and child every day, has been put down as a cause. In my own case blowing hard on a cornet was assigned as the cause; but I am disposed to think that strains are overestimated as causes, something like the old *fons et origo* of hip-joint disease, a fall, which children get so frequently without bad results. The twist of the cord has occurred in boys lying in bed and without the history of exertion, so strain is not the only cause at any rate.

"The theory of the misdirected energy of the gubernaculum is not altogether acceptable, for even if the gubernaculum has all the power

¹ Brit. Med. Journal, November 18, 1893, p. 1247.

² Med. Chir. Trans., London, loc. cit., p. 259.

ascribed to it, it is difficult to see how, being fixed at the lower end, it can swing the testis round and round." At best muscular fibres are only occasionally found in the gubernaculum; it exerts no traction; is a fibrous cord only acting as a guide.¹

I am not so sure that the spasmodic action of the cremaster in some cases is so innocent of the malposition as the gubernaculum, when, as Agnew puts it, the testicle becomes the sport of the cremaster and gubernaculum.

The lower fibres of the internal oblique muscle usually appear very thin and of a pale color as they arise from the upper surface of the inner border of Poupart's ligament externally to the spermatic cord, across which they curve downward, and, becoming tendinous, blend with the tendon of the transversalis muscle at the crest of the pubes. The spermatic cord usually receives an investment of fascia from the contiguous border of the internal oblique muscle, consisting of loops of loose cellular tissue and muscle-fibres called the cremaster. The muscular covering is usually more pronounced at the outer part of the cord, and is always more easily distinguished than the other coverings. In some bodies it is difficult to trace any connection between the cremaster, even when well developed, and the lower border of the internal oblique, the former appearing to be festooned across from Poupart's ligament externally to the cord to the pectineal line of the pubes. In several cases of undescended testicle some looped fibres corresponding to the cremaster have been found in the scrotum.²

That the movement of the testicle in the scrotum is due partly to the cremaster can hardly be doubted, and when we have more force exerted on one side from the greater development of the muscle on one side, it is not hard to imagine a twist from the same source, though I am bound in fairness to say that the twists found are not confined to one direction.

Van Buren and Keys mention a case of acquired monorchidism when the right testicle was suddenly and violently drawn up into the inguinal canal during masturbation and did not come down again.

¹ McClellan's Regional Anatomy, Vol. II, p. 89.

² McClellan's Regional Anatomy, loc. cit., pp. 85 and 86.

Later in life, when the patient died, the testicle was found soft, atrophied, pulpy, and about one-fifth the size of its fellow.¹

Whatever the cause or causes may be, and they are more or less in the domain of speculation at present, the pathology is not quite so indefinite. The twist in the cord is either so marked that both arterial and venous stasis is produced or the vein, being less resilient than the arteries, has the brunt of the pressure, and circulation ceases with resulting necrosis unless relief is at hand, as in Case No. 7, when Mr. Nash unwound the cord without operation and restored the circulation thereby.

I have, through the kindness of Dr. W. W. Keen, of Philadelphia, a microscopic report of his Case No. 3, in which Dr. Bevan says,—

“Upon puncturing the testicle posteriorly with a sterilized needle, it was observed that the parenchyma was exceedingly soft and granular, having been broken down and destroyed either directly by the microbes or indirectly through interference with its blood-supply. There were also large clots in the veins. The connective tissue had not as yet succumbed to the pathologic process and contained in its meshes the degenerated cells referred to. Upon withdrawing the needle there oozed out a little thin and blackish fluid. Cover-glass impressions were made and tubes inoculated. The cover-glass films were treated with acetic acid and stained by a rapid method with methyl violet. Examining these slides with a microscope I found innumerable cocci and bacilli to be present. The thrombi in the veins were infected as proved by stains made from the removed coagula. Although attempts were made to secure cultures from the infected organ, no growths could be obtained; presumably the antiseptic used in the operation had destroyed their vitality. In sections of the organs no germs were present in the parenchyma, but the clots in the vessels of the epididymis contained innumerable bacteria.”² Speaking of the infection that occurs in hernia, Dr. Bevan goes on to say, “Most important among these was a small bacillus and a coccus resembling, though not identical with, some of the cocci of suppuration.

“The two organisms had been isolated from gangrenous intestines,

¹ Genito-urinary Diseases, p. 392.

² Phila. Med. News, April 30, 1892.

the result of strangulation in the human subject. They had also been demonstrated as being the saprophytes of the intestines, and only springing into action when the intestine was subject to unfavorable conditions affecting materially the circulation or obstructing the flow of the contents.

"The method by which infection occurred was presumed to be as follows: When the lumen of the intestine had become occluded, permitting the production of ptomaines in large amount, this led to inflammation which afforded a suitable nidus for infiltration of saprophytes.

"The bacillus seemed more active than the coccus, and could be found not only in the gangrenous bowel, but in the fluid contained in the hernial sac. The cocci were found only in the walls of the sloughing tissue.

"With these experiments borne distinctly in mind, we are able to arrive at a more definite idea of the method by which infection at this place in the testicle occurred. There had been a hernia which evidently had not become gangrenous itself, but, on account of the strangulation to which it had been subjected, the micro-organisms had penetrated its walls and thus infected the vessels of the epididymis. The bacilli are supposed to be active in the production of gas, and some observers ascribe to the cocci the power of engendering gangrene."¹

Bearing on this source of infection, for there is more or less mystery how infection begins in closed cavities, let me quote a recent article by G. R. Fowler,² who says,—

"Evidence is constantly accumulating which shows that the common bacillus of the colon is not always an innocent micro-organism. It may pass the barrier of the intestinal mucosa (although under proper conditions it may also set up an active desquamative process here) and penetrate into the general circulation, producing disturbances in a wide variety of organs and virulent toxic effects upon the system at large. It has been found by Wyss in a case of enlarged spleen; by Larulle, Roux, Rodet, and A. Fränkel in suppurative peritonitis; by Tavel in a hæmatoma following thyroidectomy; by Gilbert, Girode, Naunyn, and others in diseases of the biliary passages;

¹ Loc. cit.

² Observations upon Appendicitis, *ANNALS OF SURGERY*. January, 1894, p. 29.

Rodet, Viellon, Jayle, Stern, and A. Fränkel found it in abscess of the liver; Levy demonstrated its presence in lymphangitis of the arm, and Chiari found it in a case of septic emphysema in a diabetic patient. Stern discovered it in a case of general pyæmic infection with suppurative meningitis. Lasage and Maxime Macaigne have found it in the stage of reaction of cholera. Its existence has been shown in cholera infantum, dysentery, broncho-pneumonia, endocarditis, meningitis, nephritis, and cystitis, by the labors of Henkemaus; Welch noted its existence in case of peritonitis consecutive to an intestinal lesion without perforation. The latter observer believes that the micro-organism does not necessarily possess, nor assume, pathogenic characteristics so long as it is brought in contact only with sound mucosa, but that following almost any lesion of the intestine it becomes migratory. My own experience accords with the observations of Viellon and Jayle, that Escherich's bacterium commune coli can produce not only inflammatory lesions but suppuration as well."

Symptoms.—These simulate strangulated hernia to a very marked degree, except that the constitutional disturbances are not so decided. Nausea, vomiting, some rise of temperature, some swelling, chill perhaps, but less acute inflammatory symptoms, crepitus of gas after mortification has set in, etc., but bear in mind the *mildness* of systemic evidences compared with the pronounced shock of strangulated hernia which exists so often even after the pain has subsided and the gut is dead. A much more important organ, the intestine, is at stake here and pleads its cause more openly than the testicle. I doubt, however, if many whose attention had not been called to this peculiar lesion, either by a previous case of their own, as was Mr. Nash's experience in Case No. 7, or late reading, would diagnose it from strangulated hernia, but now that it is a recognized possibility, it should enter into the make-up of diagnosis by elimination in this region. The following are a few points tabulated that may aid in a differential diagnosis:

No.	STRANGULATED TESTICLE.	STRANGULATED HERNIA.	BUBO.
1	Moderate shock.	Marked shock.	No shock.
2	Possible strain.	Probable strain.	History of sore or venereal disease.
3	Undescended testicle often.	Normal testicle.	Normal testicle.
4	External abdominal ring empty.	Occupied.	Ring empty.
5	Cord twisted but not obscured.	Cord obscured.	Cord normal.

Exploratory incision is the crucial test, however, and, now that we explore all cavities with comparative impunity, it may be interesting to speculate in cases of doubt, but we have in the incision the means of making an end of uncertainty.

In appearance the testicle is not unlike the dark gangrenous gut, but the comparative weight of the two clear up that delusion. It has been appropriately likened to a ripe plum.

Prognosis.—After removal all cases have recovered. In one or two cases the kink has been untwisted after the incision, but further reports state that the testicle has sloughed away as it was too far sphacelated to recover. I do not think the testicle has the same chance for recuperation as a similarly compressed gut, as the veins are so unsupported, as we see in varicocele, that the congestion is harder to reduce per *vias naturales*. In one case, as above stated, the kink was untwisted without operation with immediate recovery, but the prognosis is largely modified by the length of time the twist has lasted.

Treatment.—The exploratory incision is the best treatment, as it clears up the diagnosis, and we can then untwist or remove the testicle as our judgment sees fit.

Taxis will only do harm, and untwisting a doubtful case might be more serious than operation if the case prove to be a hernia, and as herniæ are a thousand to one strangulated testicle, we should be very sure of our diagnosis before we set to work to twist or untwist the cord. Of course, drainage is very essential after the removal of a gangrenous testicle. The question of operating for the permanent cure of the often accompanying hernia is best left to the judgment of the operator in individual cases.

TABLE OF CASES OF STRANGULATED TESTICLE.

No.	OPERATOR.	AGE.	SIDE.	HERNIA.	CAUSE.	DESCENT.	TWIST.	TREATMENT.	REPORTER.
1	Whipple, Nash.	16	Left.	None.	Strain.	Undescended.	Two twists.	Removal.	Brit. Med. Journ., January 6, 1891.
2	Thos. Bryant.	15	"	"	No cause assigned.	"	Three half twists out.	Untwisted, atrophy.	(Royal) Med. Chir. Trans., Vol. LXXV, p. 247.
3	W. W. Keen.	23	Right.	Yes.	Strain.	"	Three half twists.	Removal.	Lancet, V, 1, 1892, p. 472.
4	Davies-Colley.	14	"	None.	None.	"	Three half twists to right.	Untwisted.	Brit. Med. Journ., April 6, 1892, p. 811.
5	H. Page.	17	"	Yes.	"	Descended.	Twist to right.	Removal.	Lancet, July 30, 1892.
6	Langton.	"	Left.	None.	"	"	Twist.	Slough.	St. Barthol. Hosp. Reports, Vol. XVII, p. 88.
7	Nash.	19	Right.	"	"	"	Half turn to left.	Untwisted without operation.	Brit. Med. Journ., April 3, 1893.
8	Barker.	15	"	Yes.	"	Undescended.	Three half turns to right.	Removal.	Lancet, April 8, 1893.
9	F. Cohen.	20	"	None.	"	"	Twice in.	"	Deutsche Zeitschr. f. Chir., 1890, p. 101.
10	Gervais.	4	Right.	None.	None.	Undescended.	Outward.	Recovery.	Med. Press, May 11, 1892.
11	Nicoladoni.	16	Right.	None.	None.	Undescended.	One turn.	Removal.	Langenbeck's Arch., 1885, p. 180.
12	Nicoladoni.	62	"	None.	None.	Undescended.	Half turn.	"	Langenbeck's Arch., 1890, p. 163.
13	Owen.	13	Left.	None.	None.	Undescended.	Three half twists to left.	"	Lancet, November 18, 1893, p. 1247.
14	R. W. Johnson.	20	"	Yes.	Strain.	Descended.		"	ANNALS OF SURGERY, March, 1893.

In conclusion, I append an abstract of the case reported by me in *ANNALS OF SURGERY*, March, 1893 :

G. R., aged twenty years, white, single, upholsterer, had inguinal hernia in left side. While blowing cornet, October 9, felt it (gut) descend. Had some symptoms of strangulated hernia, vomiting, pain over tumor. Seen in consultation with Dr. Clewell, October 11. Condition fair; no marked symptoms of strangulated hernia except irreducible, slightly painful tumor in scrotum. The next day a suspicious crackling on pressure in the vicinity of the tumor induced me to cut down over it after reducing a part under anæsthesia. Found sac thickened, but containing no gut or omentum, but below it lay the testicle, gangrenous and emphysematous from a series of twists of the cord, which had cut off the circulation. Removed testicle and sac after tying it near external ring. Closed wound as usual, allowing capillary oozing to form clot, and inserted a sliver of gauze in the lower extremity of the wound in case drainage was necessary. It was removed in forty-eight hours, and the incision healed without further trouble.